From the staff of the Royal Gardens, Kew, I received ready assistance in many practical matters in the conduct of the cultures; my thanks are especially due to the curators, Mr. Watson and Mr. Nicholson.

November 19, 1896.

Sir JOSEPH LISTER, Bart., President, in the Chair.

Dr. Francis Elgar was admitted into the Society.

A List of the Presents received was laid on the table, and thanks ordered for them.

In pursuance of the Statutes, notice of the ensuing Anniversary Meeting was given from the Chair.

Mr. Shelford Bidwell, Professor Bonney, and Mr. Horace Brown were by ballot elected Auditors of the Treasurer's accounts on the part of the Society.

The Secretary read the Titles of the Papers received since the last meeting, which, under the new Standing Orders, had been published (see 'Proceedings,' No. 362).

The following Papers were read:—

I. "The Reproduction and Metamorphosis of the Common Eel (*Anguilla vulgaris*)." By G. B. Grassi, Professor in Rome. Communicated by Professor E. Ray Lankester, F.R.S.

II. "Total Eclipse of the Sun, 1896.—The Novaya Zemlya Observations." By Sir George Baden-Powell, K.C.M.G., M.P. Communicated by J. Norman Lockyer, C.B., F.R.S.

III. "Preliminary Report on the Results obtained with the Prismatic Camera during the Eclipse of 1896." By J. Norman Lockyer, C.B., F.R.S.

"The Reproduction and Metamorphosis of the Common Eel (*Anguilla vulgaris*)." By G. B. Grassi, Professor in Rome. Communicated by Professor E. Ray Lankester, F.R.S. Received October 19, 1896. Read November 19, 1896.

Four years of continual researches made by me in collaboration with my pupil, Dr. Calandruccio, have been crowned at last by a success beyond my expectations, that is to say, have enabled me to

dispel in the most important points the great mystery which has hitherto surrounded the reproduction and the development of the Common Eel (*Anguilla vulgaris*). When I reflect that this mystery has occupied the attention of naturalists since the days of Aristotle, it seems to me that a short extract of my work is perhaps not unworthy to be presented to the Royal Society of London, leaving aside, however, for the present, the morphological part of my results.

The most salient fact discovered by me is that a fish, which hitherto was known as *Leptocephalus brevirostris*, is the larva of the *Anguilla vulgaris*.

Before giving the proofs of this conclusion I must premise that the other Murænoids undergo a similar metamorphosis. Thus, I have been able to prove that the *Leptocephalus stenops* (Bellotti), for the greatest part, and also the *Leptocephalus morrisii* and *punctatus* belong to the cycle of evolution of *Conger vulgaris*; that the *Leptocephalus hœckeli*, *yarrelli*, *bibroni*, *gegenbauri*, *köllikeri*, and many others imperfectly described by Facciola, and a part of the above-named *Leptocephalus stenops* of Bellotti, belong to the cycle of evolution of *Congromurœna mystax*; that the *Leptocephalus tœnia*, *ornatus*, and *diaphanus* belong to that of *Congromurœna balearica*; that under the name of *Leptocephalus kefersteini* are confounded the larvæ of various species of the genus *Ophichthys*; that the *Leptocephalus longirostris* and the *Hyoprorus messanensis* are the larvæ of *Nettastoma melanurum*, and that the *Leptocephalus oxyrhynchus* and other new forms are larvæ of *Saurenchelys cancrivora*, and that finally a new little Leptocephalus is the larva of *Murœna helena*.

The form known as Tylurus belongs to Oxystoma, of which we unfortunately know nothing more than a figure by Raffinesque. I have not been able to find the Leptocephalus of *Myrus vulgaris*, of which I have had only a single young individual, in which the transformation was already far advanced. Neither have I found the Leptocephalus of *Chlopsis bicolor*, a very rare form, which is related to *Murœna* and to *Murœnichthys*. As the result of these observations, the family of the Leptocephalidæ has been definitely suppressed by me; the various forms of that family are, in fact, the normal larvæ of the various Murænoids.

In regard to the greater part of the above-named species, the control has been threefold, namely :—

Firstly, anatomical. I have compared the various stages in all their structures, and have made the due allowance for the changes brought about by the metamorphosis at the close of larval life.

Secondly, natural. I have found in nature all the required transitional stages.

Thirdly, experimental. I have followed, step by step, the metamorphosis in aquariums.

Therefore, the hypothesis of Günther that the Leptocephali are abnormal larvæ, incapable of further development, must be rejected. All this is related by myself at length, with all historical details which concern the question, in a large memoir which is about to appear in the Journal edited by Professor Todaro.

Until now all these facts have been unknown because normally they can only be observed in the abysses of the sea at a depth of at least 500 metres. Fortunately, along a part of the coast of Sicily strong currents occur, which must be ascribed to the tide, producing very large displacements of the water in the narrow Strait of Messina. I shall give further details concerning these currents in my large memoir. In consequence of the strong currents, sometimes—I say sometimes, because there is no regularity, and one may have to wait for a year without obtaining any material—not only many deep-sea fishes, but also all stages of the development of the Muræ-noids are met with in the surface-water. To these currents we owe all the captures of *Murœna helena* with ripe eggs, which is in accordance with what I had already argued from other facts, namely, that the reproduction of the Muræenoids takes place at great depths of the sea.

Before I proceed to speak of the Common Eel, I must premise that Dr. Raffaele has described certain pelagic eggs as belonging to an undetermined species, putting forward the suggestion that these eggs belong to some Muræenoid. This matter has been investigated by myself, and I have shown that the newly hatched larvæ (called "præ-larvæ" by me) derived from these eggs have essentially the character of Leptocephali.

The life history of the Muræenoids, leaving aside for the present the Common Eel, is as follows:—Females can only mature in very profound depths of the sea, that is to say, at least a depth of 500 metres. This fact I established by finding well-known deep-sea fishes together with Leptocephali, ripe Muræenæ, and quite ripe eels (see below). The females of those species which do not live at this depth must therefore migrate to it. The male, however, can mature at a smaller depth, and therefore they migrate into the greater depth when they are already mature. Fertilisation takes place at great depths; the eggs float in the water; nevertheless they remain at a great depth in the sea, and only exceptionally, for unknown reasons, some of them mount to the surface.

From the egg issues rapidly a præ-larva, which becomes a larva (Leptocephalus) with the anus and the urinary opening near the tip of the tail. The larva then becomes a hemi-larva, the two apertures just named moving their position towards the anterior part of the body, which becomes thickened and nearly round. By further change the hemi-larva assumes the definitive or adult form. The

larva, as well as the hemi-larva, shows a length of body much greater than that exhibited by the young Murænoid of adult form into which they are transformed. By keeping specimens in an aquarium, I was able to establish a diminution of more than 4 cm. during the metamorphosis. With regard to the greatest length which the larva can attain in a given species, and the amount of diminution which accompanies metamorphosis, there are great individual variations.

The history of the Common Eel, to which I am now about to refer, is very similar to that given above for the other Murænoids. The Common Eel (*Anguilla vulgaris*) undergoes a metamorphosis, and before it assumes the definitive adult form it presents itself as a Leptocephalus, which is known as *Leptocephalus brevirostris*. This Leptocephalus was discovered in the Strait of Messina many years ago. A specimen was also captured by the "Challenger," and another specimen was taken by the Zoological Station of Naples in the Strait of Messina. This form is occasionally carried to the surface by currents. By exception, in the month of March, in the year 1895, we captured several thousands of them in one day, but the best way to secure this Leptocephalus (and a very easy one) is to open the intestine of the *Orthagoriscus mola*, a fish which is common in the Strait of Messina, and in it one is certain to find a very large number of specimens. It must be observed that *Orthagoriscus mola* is a deep-sea fish. The specimens of *Leptocephalus brevirostris* found in the intestine of Orthagoriscus are more or less altered by digestion. Those specimens of *Leptocephalus brevirostris* which are taken near the surface in the open sea are in a better state of preservation, but, unfortunately, these also frequently have the epidermis injured so that they cannot maintain their life in an aquarium for more than a few days; they live long enough, however, to allow us to observe that it is their habit to conceal themselves in the sand or in the mud as the Common Eel (Anguilla) does. Here it is to be noted that the various forms of Leptocephali have habits resembling those of the Murænoids to which they belong, *i.e.*, they dig into the sand or abstain from doing so according as the adult form has or has not this habit.

I now pass on to the characters of *Leptocephalus brevirostris*. I give them here in the same order as I shall use in my larger memoir. The length varies from 77—60 mm., the same extent of variation as observed in other Murænoids. The caudal fin tends to assume the form which it has in the Elver* or young Anguilla. It is to be noted that in other Leptocephali the caudal fin also tends always to exhibit the adult form. The lower jaw projects sometimes more than the

* The word "Elver" is used in this paper in its strict sense, viz., for the young form of *Anguilla vulgaris* as taken when ascending rivers in vast numbers.

upper jaw, as in Anguilla. The margin of the mouth is wide, as in Anguilla. The tongue is free, as in Anguilla. On the other hand, the youngest elvers which I have observed, have smaller eyes than *Leptocephalus brevirostris*, and this need not surprise us since we know that in other species of Murænoids the diminution of the eyes occurs during the metamorphosis. The nostrils are separated from one another, the anterior tubes are relatively at a considerable distance from the tip of the snout and from the rim of the mouth. They are in a position in which they are observed in many other Leptocephali, which are destined to transform themselves into adult forms having the anterior nostrils in nearly the same position as in the Common Eel. The posterior nostrils, on the contrary, are not tube-like, and are in the same position as those occupied in the adult Anguilla. It is worth remarking that in other Leptocephali also the posterior nostrils have already assumed the adult position when the anterior ones are still far removed from it. In *L. brevirostris* I find a larval dentition, which resembles that of the other Leptocephali. In correspondence with the small size of *Leptocephalus brevirostris* the number of larval teeth is small. Researches founded, firstly, on the enumeration of the myomeres; secondly, upon the enumeration of the dorsal and ventral arches of the vertebræ of the caudal extremity (hypurals); and, thirdly, upon the enumeration of the posterior spinal ganglia, lead with great certainty to the conclusion that the *Leptocephalus brevirostris* is the larva of a Murænoid, the number of whose vertebræ must lie between 112 and 117, most probably 114 or 115. Such a Murænoid is the *Anguilla vulgaris*. The Murænoid indicated cannot be any other of those occurring in the Mediterranean, because they all have a number of vertebræ higher than 124.* Counting the myomeres in *Leptocephalus brevirostris* one finds generally only 105 complete, five others incomplete, and all the others in a state of transparency and incomplete formation. These latter are fortunately at the posterior extremity, where other criteria come to our assistance, namely, the spinal ganglia and the vertebral arches. To show how I arrive at the number of vertebræ which must be possessed by the adult individual, corresponding to a given *Leptocephalus brevirostris*, I quote the following example:—I assume that three vertebræ develop themselves in correspondence to the first four incomplete myomeres, and that 105 must develop themselves in relation to the 105 complete myomeres, that is to say, between the fourth and fifth myomeres, between the fifth and sixth, and so on, until we reach the 105th vertebra, lying between the 104th and 105th myomeres. I

* *Murænesox savanna* is said to have 109 vertebræ, but it is doubtful whether it really occurs in the Mediterranean. The position of its nostrils and the number of its branchiostegal rays render its association with *Leptocephalus brevirostris* impossible.

further conclude that seven other vertebræ are developed at the caudal extremity, as indicated by the number of vertebral arches and the spinal ganglia in that region. We count, therefore, in all 115 vertebræ, and this is the number which can be easily seen in many specimens of *Anguilla vulgaris*.

Here I must particularly insist that I have ascertained in an absolute manner that during the metamorphosis of the Murænoids, the number neither of the myomeres nor of the vertebral arches, nor of the spinal ganglia is subjected to any change. The hypurals of *Leptocephalus brevirostris* are precisely the same as in the elver of *Anguilla vulgaris*. The last hypural which is fused with the urostyle may present itself as a single piece, or may be more or less cleft. These are variations which are met with also in the elver. Just as in the elver, the last hypural but one is always extensively cleft, or, if the expression is preferred, doubled. To the last hypural correspond five rays, whilst four correspond to the last but one, and one to the last but two, the whole structure being identical with that found in the elvers of *Anguilla vulgaris*. Of these ten rays, the eighth, seventh, and sixth are bifid, both in *Leptocephalus brevirostris* and in the elvers of *Anguilla vulgaris*. In the pectoral fin of *Leptocephalus brevirostris* the definitive rays can be observed, and these are of the same number as in the elvers of *Anguilla vulgaris*. *Leptocephalus brevirostris* is transparent, and has colourless blood. The red corpuscles are wanting, but there are present so-called "blood-plates" ("Blutplättchen" in German) similar to those of the inferior vertebrates. The bile is also colourless. This fact is observed in all the other Leptocephali. *Leptocephalus brevirostris* is, however, the only one which is free from all pigmentation. Correspondingly, the Common Eel is the only species of Murænoid which at the close of metamorphosis is devoid of all trace of larval pigmentation. It was this observation which first led us to the discovery of the relations between *Leptocephalus brevirostris* and *Anguilla vulgaris*.

In making transverse sections of *Leptocephalus brevirostris*, I found other characters which confirm the relation between it and the Common Eel; for instance, the branchiostegal rays are ten to eleven in number, as is also observed in the elvers of *Anguilla vulgaris*. In the Common Eel the well-known lateral branch of the fifth pair of the cranial nerves exists. It is also found in *Leptocephalus brevirostris*. This lateral branch could not be found by Dr. Calandruccio in the other common Murænoids of Sicily, and is wanting also in the other Leptocephali.

The mucous-canal-system (sensory canals) in the head are already developed, partially, in *Leptocephalus brevirostris*, and are incompletely developed in the elver. As in the elver, so in *Leptocephalus brevirostris*, the pyloric cœca are wanting. The blind extremity of

the stomach and the incompletely developed swim-bladder, which is as yet free from contained gas, are present both in *Leptocephalus brevirostris* and in the elver of *Anguilla vulgaris*. The pronephros is in active function as in the other Leptocephali. The Malpighian glomerules of the kidney (mesonephros) are lobed as in the eel, and their number corresponds with that observed in the Helmichthys stage, of which I will speak further on. The genital gland, not yet sexually differentiated, is almost identical with that of the same stage. In short, it may be said that the whole organisation of *Leptocephalus brevirostris* corresponds with the organisation of the Common Eel, if we make allowance for those changes, which are observed in the matamorphosis of the other species of Murænoids, such as reduction of the pancreas and of the liver, disappearance of the proto-skeleton, complication of the musculature, increase in size of the cerebellum, loss of the larval teeth, development of the definitive teeth, &c.

From the description of these Leptocephali I must pass on, briefly, to speak of the stages nearer to the condition of the elver. I am, however, obliged to leave a break in the series, which, however little its significance, yet certainly will make some impression on the minds of those who do not realise with what caution I have formed my conclusions. I must confess that since I have learnt how difficult it is to procure an entire series of the development of a Murænoid, I am more astonished at being able to recognise a single stage in the development of a given species than at not finding the whole series. I must point out that the break in my series of the development of *Anguilla vulgaris* would have been much smaller if I could have persuaded myself to kill and preserve one of the hemi-larvæ which I happened to meet with at the end of the year 1892. They were really transitional stages between *Leptocephalus brevirostris* and that stage which I shall describe further on. I published this fact in a preliminary note in the month of May, 1893. They were transparent with almost colourless blood, without any trace of pigmentation except at the eyes, and had lost all the larval teeth, whilst they possessed already very few and very minute teeth of the definitive series. The body was thickened, and already showed the cylindrical form. They measured little less than 8 cm. In short, they were *Leptocephalus brevirostris* on the way to transformation into *Anguilla vulgaris*. As a matter of history they actually did transform themselves in my aquarium with the usual diminution in their dimensions, and subsequently proceeded to increase in bulk.* The metamorphosis took place as usual without the animal taking in any

* The fact that I actually have obtained in an aquarium the transformation of *L. brevirostris* into *Anguilla vulgaris* is of prime importance. The time occupied was one month.

nourishment whatever. The resumption of growth was accompanied by a resumption of feeding. Unfortunately, I had no other individuals of this stage.

The stage which I now pass on to describe can be obtained during the winter in the sea. I have never found them at the mouths of rivers. The length varies from 54 to 73 mm. Most individuals measured about 65 mm. The body is relatively longer than in the elver. It is also relatively deeper, as in Leptocephalus. We are reminded of Leptocephalus also by the pigment of the eye, the vitreous transparency of the body, the swim-bladder being indistinguishable in the living animal, and the absence of all larval pigmentation. The blood is slightly coloured, and the bile is already green. Slight pigmentation can be seen along the central nervous system, and at the middle part of the caudal fin. This commencement of the definitive or adult pigmentation in the regions named before it occurs in any other part is also seen in other Murænoids. The definitive teeth are very minute, and few in number. The intestine contains no food. After what I had observed in the other Murænoids, the simple observation of the barely indicated teeth, and of the absence of aliment in the gut, would have been sufficient to convince me that the stage now under notice must be preceded by a Leptocephalus phase. Indeed, if we did not admit such a preceding history, we could not understand how this little fish could have attained such a size without acquiring well developed teeth, and without nourishing itself.

In conclusion, no one would hesitate, even not knowing *Leptocephalus brevirostris*, to refer the stage now under discussion to a Murænoid about to complete its Leptocephalus metamorphosis, were it not for the fact that there has been so much question concerning the reproduction of the Common Eel, and that so many capable observers have failed in dealing with it, that every new observation is received with scepticism. The stage of which I am now speaking, in the hands of a pure systematist, would probably be described as a Helmicthys, a genus established for certain forms of Leptocephali far advanced in transformation.

The next forms to which I have to refer are captured in the course of migration from the sea into fresh water. When kept in an aquarium they assume the characters of the elver, diminishing more or less in volume, and without nourishing themselves. The elvers of the Common Eel can present themselves in stages differing little from that last described, as well as in a form which has already developed the full pigmentation of the adult. Even those which most resemble the preceding stage always have a character which distinguishes them easily, namely, the presence of definitive pigment, more or less superficially placed on the head, and not to be

confounded with the pigment round the posterior extremity of the brain, which latter is already present in the preceding stage. In specimens taken at the mouths of rivers this more or less superficial pigment was, so far as I could ascertain, always present.

As the pigmentation develops itself, the little eel gradually undergoes a diminution in all its dimensions. It results from my measurements, that the fully pigmented elver has an average length of 61 mm., while for the more or less colourless elver the average length is 67 mm. I found pigmented elvers which were reduced in length to 51 mm., a size which I never observed in those elvers in which the development of pigment had not taken place.

The facts which I have stated demonstrate that the eel goes through a metamorphosis, and that *Leptocephalus brevirostris* is its larva. Some further considerations remain to be given, although I believe that zoologists will not consider the question still an open one after the record of facts given above—facts, which anyone may verify by examining the material which is preserved in my hands. Many to whom I have related my discovery of the history of the Common Eel have objected that eels are found almost everywhere, whilst *Leptocephalus brevirostris* is limited to Messina. In reply, I must say that, first of all, it is not true that *Leptocephalus brevirostris* is limited to Messina; secondly, that at Messina there are special currents, which tear up the deep-sea bottom which everywhere else is inaccessible; thirdly, although it is true that on the coasts of many countries where *Anguilla vulgaris* is found, no one has ever seen a *Leptocephalus brevirostris;* it is also true that in no country, not even in those where eels are abundant, has anyone ever seen an eel of less than 5 cm. in length. Since it has to be admitted that no one knows the eel before it arrives at the length of 5 cm., there is no greater difficulty in supposing that during this unknown period the eel passes through a Leptocephalus stage than in supposing that it does not do so. The critical study of the literature of this subject, and a great many continued observations, have occupied me for many years, and have been undertaken just in those places where young eels are to be found. They enable me, from my own studies, to affirm with assurance that young eels with the definitive adult form do not exist of less than 5 cm. in length.

From the study of the memoir of Raffaele on pelagic eggs, I have come to the conclusion that the eggs of his undetermined species No. 10, having a diameter of 2·7 mm. and differing from all the others in the absence of oil globules,* must belong to the *Anguilla*

* Renewed researches have convinced me that this egg is that of *Anguilla vulgaris*. There is, however, another egg belonging to an undetermined Murænoid which is devoid of oil-drops, and can easily be confused with the true eggs of *Anguilla*.

vulgaris, because from them Dr. Raffaele obtained præ-larvæ which had only forty-four abdominal myomeres. I endeavoured for two years in vain to study these eggs at the Zoological Station of Naples. I found only a few of them, and these died prematurely.

In another point my researches have yielded a very interesting result. As a result of the observations of Petersen, we know now that the Common Eel develops a bridal coloration or "mating habit," which is chiefly characterised by the silver pigment without trace of yellow, and by the more or less black colour of the pectoral fin, and finally by the large eyes. Petersen inferred that this was the bridal coloration from the circumstance that the individuals exhibiting it had the genital organs largely developed, had ceased to take nourishment, and were migrating to the sea. Here Petersen's observations cease and mine begin. The same currents at Messina which bring us the Leptocephali bring us also many specimens of the Common Eel, all of which exhibit the silver coloration. Not a few of them present the characters described by Petersen in an exaggerated condition, that is to say, the eyes are larger and nearly round instead of elliptical, whilst the pectoral fins are of an intense black. It is worth noting that in a certain number of them the anterior margin of the gill slit is intensely black, a character which I have never observed in eels which had not yet migrated to the sea, and which is wanting in the figures and in the originals sent to me by Petersen himself. Undoubtedly the most important of these changes is that of the increase of the diameter of the eye, because it finds its physiological explanation in the circumstance that the eel matures in the depths of the sea. That, as a matter of fact, eels dredged from the bottom of the sea have larger eyes than one ever finds in fresh-water eels, I have proved by many comparative measurements, made between eels dredged from the sea bottom and others which had not yet passed into the deep waters of the sea. Thus, for instance, in a male eel taken from the Messina currents and having a total length of $34\frac{1}{2}$ cm., the eye had a diameter, both vertical and transversal, of 9 mm., and in another eel of $33\frac{1}{2}$ cm., the same measurement was recorded. In a female eel, derived from the same source and purchased in the market, whose length was $48\frac{1}{2}$ cm., the vertical diameter of the eye was 10 mm., and the transversal diameter rather more than 10 mm. These are not the greatest dimensions which I observed, and I conclude from these facts that the bridal habit described by Petersen was not quite completed in his specimens, and that it becomes so only in the sea and at a great depth. In relation to these observations of mine stands the fact that the genital organs in the eel taken in the Messina currents are sometimes more developed than in eels which have not yet entered the deep water. Thus it has happened that male individuals have occurred showing

in the testes here and there knots of spermatozoa. These spermatozoa are similar to those of the *Conger vulgaris*, and must be considered as ripe. As is well known, so advanced a stage of sexual maturity has never before been observed in the Common Eel. This appears to be due to the fact that the males hitherto examined had not yet migrated into the deep water of the sea.

Eels with big eyes taken from the depths of the sea were, before the above facts were known, described as a distinct species under the name of *Anguilla bibroni* (Kaup) and of *Anguilla kieneri* (Kaup), not to be confounded with *Anguilla kieneri* (Günther), which is a synonym of *Lycodes kieneri*.

In certain cloacæ of ancient Rome which to-day are disused and contain pure water, remarkable eels are found of a length of from 20—30 cm. of a grey colour, without trace of yellow, of male and female sex, with enormous eyes and with more or less rudimentary genital organs. They are individuals which, confined in a place without light, have acquired prematurely one of the characters of the bridal habit without a corresponding development of the genital organs. These individuals are probably incapable of ulterior development, as the condition of their genital organs seems to demonstrate.

Under the name *Anguilla kieneri* (Kaup) there have probably been included some individuals which had acquired big eyes under conditions similar to those described for the eels of these Roman cloacæ. From these and similar observations it clearly results that all the European eels must be included under a single species, and this is an important fact from another point of view, namely, that it destroys an objection which might be raised against my conclusion with regard to the development of *Anguilla vulgaris* from *Leptocephalus brevirostris*, namely, the objection that *Leptocephalus brevirostris* belongs not to *Anguilla vulgaris*, but to *Anguilla kieneri*, or to *Anguilla bibroni*.

To sum up, *Anguilla vulgaris*, the Common Eel, matures in the depths of the sea, where it acquires larger eyes than are ever observed in individuals which have not yet migrated to deep water, with the exception of the eels of the Roman cloacæ. The abysses of the sea are the spawning places of the Common Eel: its eggs float in the sea water. In developing from the egg, it undergoes a metamorphosis, that is to say, passes through a larval form denominated *Leptocephalus brevirostris*. What length of time this development requires is very difficult to establish. So far we have only the following data:—First, *Anguilla vulgaris* migrates to the sea from the month of October to the month of January; second, the currents, such as those of Messina, throw up, from the abysses of the sea, specimens which, from the commencement of November to the end of July,

are observed to be more advanced in development than at other times, but not yet arrived at total maturity; third, eggs, which according to every probability belong to the Common Eel, are found in the sea from the month of August to that of January inclusive; fourth, the *Leptocephalus brevirostris* abounds from February to September. As to the other months, we are in some uncertainty, because during them our only natural fisherman, the *Orthagoriscus mola*, appears very rarely; fifth, I am inclined to believe that the elvers ascending our rivers are already one year old, and I have observed that in an aquarium specimens of *L. brevirostris* can transform themselves into young elvers in one month's time.

"Total Eclipse of the Sun, 1896.—The Novaya Zemlya Observations." By Sir GEORGE BADEN-POWELL, K.C.M.G., M.P. Communicated by J. NORMAN LOCKYER, C.B., F.R.S. Received November 19,—Read November 19, 1896.

(Abstract.)

The author gives an account of the circumstances under which it became desirable to fit out an expedition to observe the eclipse in Novaya Zemlya, and the arrangements made to convey it by his yacht "Otaria."

Details are given of the observing station, the erection of the different instruments, and the scheme of work.

The valuable spectroscopic results obtained are still under process of being worked out; but the coronagraph results are reported in detail, and copies of the chief photographs are appended. The meteorological and other conditions during the eclipse are duly recorded.

"Preliminary Report on the Results obtained with the Prismatic Camera during the Eclipse of 1896." By J. NORMAN LOCKYER, C.B., F.R.S. Received November 17,—Read November 19, 1896.

(Abstract.)

The author first states the circumstances under which Sir George Baden-Powell, K.C.M.G., M.P., with great public spirit conveyed an eclipse party to Novaya Zemlya in his yacht "Otaria," to which party was attached Mr. Shackleton, one of the computers employed by the Solar Physics Committee.

The prismatic camera employed, loaned from the Solar Physics